APPENDIX IV
HYDROPOWER
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APPENDIX IV
HYDROPOWER

IV-1. Background. The earliest hydropower plants at Corps projects were constructed at navigation dams, as joint efforts with electric utility companies. The utilities built the power plants, and the Corps usually built the navigation locks. Later, Congress authorized the Corps to construct its own power plants at dams being built for flood control, navigation and other purposes. Most of these projects were placed into service during the decades following World War II. The Corps is the largest owner/operator of hydroelectric power plants and the single largest producer of hydroelectric power in the United States. Many of the projects at which hydropower facilities are located provide other outputs such as navigation, flood damage reduction, water supply, ecosystem restoration and recreation. The Corps has 76 plants with 356 generating units representing a total installed capacity of 20,750 megawatts and produces about 70 billion kilowatt-hours a year.

IV-2. Program Mission. The mission of the Corps' Hydropower Business program is to provide reliable hydroelectric power services at the lowest possible cost, consistent with sound business principles, in partnership with other Federal hydropower generators, the Power Marketing Administrations, and Preference Customers, to benefit the Nation.

IV-3. Civil Works Program Objectives.

a. Table IV-1 links the Civil Works (CW) Strategic Plan of March 2004 with the Hydropower Business program strategic objectives and performance measures. A key assumption in the development of the 2004 CW Strategic Plan was the availability of unconstrained resources to achieve program objectives. The development of the FY 2009 Hydropower program budget will acknowledge a constrained budget environment and, in that context, will attempt to improve budget development based on unambiguous strategic objectives and performance measures.

b. The purpose of the Civil Works Five Year Development Plan (FYDP) is to present an overview on how funding for Civil Works programs over a five-year period will produce results that contribute to the achievement of strategic goals and objectives outlined in the Civil Works Strategic Plan. See paragraph 8 (b), "Civil Works Five Year Development Plan," of the CW Strategic Plan. The FYDP for the Hydropower Business Line provides a regional (System and/or Watershed) management tool for use in accomplishing the Corps of Engineers' hydropower mission while providing the budgetary framework necessary for program development. They present an opportunity to objectively evaluate planning, design, construction, and operations and maintenance phases of new, continuing, and existing projects broken down into the three major appropriations Investigations (I), Construction (C), and Operations & Maintenance (O&M).

TABLE IV-1 Strategic Plan Objectives and Performance Measures	
1. Invest in hydropower rehabilitation projects when the benefits exceed the costs.	- Remaining Benefits to Remaining Cost Ratio (project specific measure)
2. Future: Invest in environmentally sustainable hydropower infrastructure improvements where economically justified.	- To be developed in the future.
3. Provide reliable hydroelectric power. 4. Provide peaking hydroelectric power. 5. Maintain capability to provide hydroelectric power efficiently.	- Unit forced outage rate. - Physical condition/failure risk index. - Peak unit availability rate.
6. Ensure that projects perform to meet authorized purposes and evolving conditions. Note: A program goal was not specifically identified for Hydropower; however, Joint Activities at multi-purpose hydropower projects should strive to achieve these objectives.	- De-rated generating units. - No measures identified for Joint Activities, but funding requests must be for critical requirements to avoid forced facility closures, public or worker life safety concerns, and/or legal mandates or treaty and Endangered Species Act compliance requirements for the budget year.

IV-4. Program Performance Measures.

a. Competition for Federal funds is very intense and getting tighter each year. In recent years, very difficult choices had to be made in distributing scarce Federal dollars. In a constrained funding environment, the many worthwhile maintenance needs must be prioritized across the entire spectrum of projects. This means that available resources have to be concentrated on the highest priority projects in terms of maximizing benefits.

b. In the Hydropower Business program, funds are being directed primarily to those facilities that will result in increased unit availability and reliability for power generation, improve the efficiency of an aged infrastructure, and rehabilitate facilities in a deteriorated state. The Corps' Hydropower Business Line is well established and valued. However, its ability to continue to provide clean environmentally sustainable energy at the lowest sustainable cost to meet the needs of current and future generations is dependent upon adequate investments. Such investments provide for the necessary investigations of problems and development of projects, timely rehabilitation of authorized projects, facility modernization or improvement, reliable operation and availability of generating units, preventive maintenance, condition assessments and adequate data collection and improvements to increase operational efficiencies. The purpose of this budget guidance is to ensure the development of a convincing rationale and justification of the Hydropower Business Line budget request.

c. Accordingly, a nationwide perspective must be maintained to ensure that available funding provides the greatest public benefit for the investment. The safety**,** security and environmental sustainability of existing hydropower infrastructure must be maintained, new evaluations to address high

yield modernization of hydropower infrastructure must be conducted, critical maintenance activities backlog must be reduced, and uncompleted projects must be brought on line quickly so that benefits may be achieved as soon as possible. To achieve the hydropower goal stated above, the program objectives and ranking criteria outlined in Table IV-2 are established for the FY 2009 program. Each of the objectives and criteria are designed to demonstrate that each budget item makes sense and directly contributes to meeting the objectives and stated goal of the program.

TABLE IV-2
Hydropower Budget Objectives, Performance Measures and Ranking Criteria

CW Program Objective	Budget Objective	Ranking Criteria
1,2, 3, 4, 5 and 6	Adequately fund R&D products to gain future efficiencies (I)	Not applicable to Hydropower Business Line. R&D is funded under remaining items for the overall Civil Works Program.
1,2, 3, 4, 5 and 6	Complete ongoing major rehab projects to start getting benefits (C)	Remaining Benefits-Cost Ratio Annual net benefits Completion in budget year.
3, 4, 5 and 6	Assure that projects perform reliably as designed (O&M)	Number of De-Rated Units (Plant Level). MW-Yrs (Specific Investment) Portion of nameplate capacity restored from investment made multiplied by remaining life of unit in years. This does not include units de-rated for lack of water, regulatory requirements, policy decisions unrelated to physical deficiencies or other unmanageable conditions.
3, 4, 5 and 6	Make sure projects are available for peaking power requirements (O&M)	MW-Yrs: Benefit for restoration of generating unit in Forced Outage status (MW nameplate capacity multiplied by remaining life of unit in years).
1, 3, 4 and 5	Ensure capability to provide power efficiently (O&M)	Improvement of risk based plant condition assessment for key power components based on the HydroAMP tool condition/failure risk assessment method. MW-Yrs (Specific Investment) Where HydroAMP data is lacking, benefits for improvement in Average Unit Age may be used as a continuing interim measure of plant condition. Nameplate capacity multiplied by life extension in years achieved by investment made.
5	Ensure that projects perform to meet authorized purposes and evolving conditions.	No forced facility closures in the budget year. No project public access life safety deficiencies in the budget year. No project workplace life safety violations. No court ordered, legal mandate or treaty violations (includes ESA) in the budget year.

d. In order to achieve these objectives and assure uniformity across the CW programs in building annual budgets, minimum funding levels have been defined. Also established is a system of performance measures that are more detailed than those in the Civil Works Strategic Plan. This will permit objective evaluation of incremental investment choices to assure that budget requests above the minimum provide the greatest benefit for the investment. These minimum funding levels and the system of performance measures will go a long way to making informed and wise budgetary decisions to support the Hydropower Business Line mission goal of improving reliability and minimizing cost and risk.

e. Effective risk management requires an inventory of each class of assets, some form of standardized condition assessment, and a method to evaluate the reliability of these assets and consequences of unsatisfactory performance. But to effectively balance tradeoffs and integrate mission objectives through a risk management approach will require some common objectives or metrics and an integrated framework. Risk management evaluates which risks identified in the risk assessment process require management and selects and implements the plans or actions that are required to ensure that those risks are controlled. These risks must be communicated effectively to our stakeholder. Risk communication take place and involve an interactive dialogue between stakeholders and risk assessors and risk managers which actively informs the other processes.

IV-5. Program Budget Screening Criteria. Definition of desired performance targets were developed with an understanding of past funding constraints and projected funding constraints.

a. New Start Definition - New start is defined as an active authorized study or project which has not received an initial work allowance and that fits into at least one of the following business lines: navigation, flood and storm damage reduction, environmental restoration, water supply, hydropower, or recreation.

b. The New Start definition will apply to Reconnaissance studies and Construction Projects, as well as any new efforts under the Remaining Items category. Any PED, which has not been funded in the Conference Report for the past three years, will also be considered a New Start. For Feasibilities, see New Phase definition. Except a new start decision would be needed for a feasibility study being initiated after, say, an O&M-funded appraisal without an intervening reconnaissance new start decision. Basic eligibility criteria for construction new starts are found in Annex B.

c. New Phase Definition - A study or project is considered to be in a NEW PHASE once it has completed the current phase that is funded and ready for budgeting in the follow-on phase, e.g. from Reconnaissance to Feasibility or Feasibility to PED, e.g. Seamless PEDs are a new phase.

IV-6. Program Rating and Ranking Criteria. In order to achieve the objectives shown in Table IV-2, budget increments have been established to assure uniformity across CW programs in developing annual budgets from the same perspective. Budget increments reflect the eligibility criteria described in the following paragraphs. Increments 1 and 2 will receive priority consideration for budget development and represents the Hydropower Business Program “Initial” budget. Other increments are described in detail in paragraph 13 c(1)(f) under Submissions” in the main text of the EC. These increments in conjunction with the business program budget objectives and ranking criteria will assist in making informed and wise budgetary decisions to support the Hydropower Business Program’s goal. All increments must be prioritized by each MSC and across appropriations. Ranking of the program will be based on performance objectives and risk-based indices as indicated in Table IV-2 and detailed information provided in the Hydropower Business Line Criteria Matrix data spreadsheet.

a. Federal Energy Regulatory Commission (FERC) Reliability Compliance Standards. The Corps of Engineers Hydropower Business Program will continue to voluntarily meet reliability requirements established by the North American Reliability Corporation (NERC). Each MSC should include in their

budget submissions activities that would be required to meet electrical reliability standards as approved by FERC and published by NERC. These activities will be ranked and considered separately their unique "ceiling." Approved reliability standards can be founded at http://www.nerc.com/~filez/standards/Reliability_Standards_Regulatory_Approved.html. Table IV-4 contains the approved reliability standards that are applicable to the Corps as a Generator Owner and Generator Operator. Reliability compliance activities that are not part of Increment 1 routine activities should be submitted in a separate increment. See Section IV-6 e(3) below.

b. Systems Approach and Risk Management. Consistent with the Civil Works Strategic Plan, a systems or watershed approach is needed to ensure that investments are integrated into a whole that preserves or enhances performance and sustainability at the system level. This requires consideration of the investment needs and priorities of all the CW Business Programs within the watershed. A systems based approach is a logical step toward coordination and focusing on requirements for making informed investments while providing maximized benefits to the public. It provides the structure for managing entire systems rather than separate elements. The Hydropower Business Line has developed risk management tools, interim risk reductions measures, and long-term investments plans to minimize the risk of forced outages or catastrophic equipment failure. These risk considerations are integrated into long range planning and multi-year development plans.

c. HydroAMP Condition Assessment. An important tool in the Hydropower Business Line's Asset Management strategy is the HydroAMP Condition Assessment tool. The majority of critical equipment in the Corp's hydropower inventory is near or beyond its design life. Equipment reliability has deteriorated, which significantly affects system generation availability. Substantial investment to repair, refurbish, or replace existing equipment is becoming necessary. An effort within the Hydropower Business Line is underway utilizing HydroAMP to determine condition indices for all major components in the power train of each generating unit. The HydroAMP Condition Index and Risk Map should be used, whenever possible, to develop budget priorities.

All FY 2009 budget item requests (studies, construction, and O&M) shall be based on each MSC FYDP and using systems and watershed principles which will include the a System codes and USGS Hydrologic Unit Classification (*HUC*) sub-region (4 digits) codes. USGS HUC codes may be found at http://water.usgs.gov/GIS/huc_name.html and the System codes are found in the Annex C – "Operations and Maintenance "

d. Initial Program Investigation and Construction. The initial program is defined by the criteria below for Investigation (I) and Construction (C) appropriations.

(1) - I: There are no projects in this category for the Hydropower Business Line.

(2) - C: The initial level for each project or separable element is limited to the amount needed for earnings (no more, no less) on the contracts funded in the FY 2008 budget and continuing into FY 2009, plus engineering and design, supervision and administration, and real estate activities associated with continuing construction of that project or separable element. Projects identified in the FY 2008 budget for consideration for suspension and other projects not budgeted in FY 2008 will have a minimum level of zero.

e. Minimum Operations And Maintenance (O&M). The minimum program for hydropower Operations and Maintenance will consist of Increments 1 and 2. Work Category Codes must be entered for each work O&M item in all increments to distinguish Power Operations and Maintenance activities from Joint Activity Operation and Maintenance activities. The Initial Increments 1 and 2 will seek to provide the greatest benefit for the investment consistent with performance measures and sufficient to meet minimum legal responsibilities for environmental compliance**,** operation and safety. Subsequent

increments will provide additional benefits as measured by the performance measures. Increments 1 & 2 should not exceed 75% of MSC O&M total in PY-1. Simple pro-rata allocations by district and/or project will not result in the expected performance based budget and should not be done. All increments must document performance according to the appropriate Business Line criteria. Operations activities should be submitted separately from maintenance activities, i.e., do not aggregate or sum operations and maintenance activities together as one activity. Additionally, do not aggregate operations or maintenance activities with a joint activity.

(1) **Increment 1** – Minimum Level. Activities included in this initial increment should only be critical routine activities that can be completed in the PY. Work activities that can be included in this increment are Critical Power Specific Operations and Maintenance Activities (Work Category Codes 603XX & 613XX), Critical Joint Operation & Maintenance Activities (Work Category Codes 606XX & 616XX). Also, other activities can be included to avoid maintenance staff reductions to a level that will preclude performance of basic routine preventive maintenance activities, forced facility closure, public or worker life safety concerns, or violation of court orders, legal or treaty obligations in the budget year.

(2) **Increment 2 –** Minimum Level**.** Activities included in this initial increment should only be critical non-routine activities. Critical non-routine activities are those that must be accomplished to insure project safety, and critical maintenance actions that are required to keep the project operating and delivering benefits. Non-routine activities are actions that are “project like” in that they are a unique action with a specific beginning and end. This increment includes major maintenance and rehabilitation. Each non-routine activity must be shown separately to allow individual funding decisions based on the performance metrics and must be shown in priority order by District and MSC Rank. The combined total amounts for Increments 1 and 2, the Minimum Level (Initial) Increment, should not exceed 75% of the amount in Table C 2.2 in Annex C (O&M) by MSC.

(3) **Increment 2.5** - North American Electric Reliability Corporation (NERC) Reliability Compliance Activities. Activities included in this increment should only be required activities to voluntarily meet reliability standards approved by NERC and are not included as routine activities in Increment 1. Increment 2.5 should not be combined with the Initial Increment (Increments 1 & 2) to meet the 75% requirement. These activities will be ranked separately and given special funding consideration in a budget wedge.

(4) **Increment 3 –** Additional Operations and Maintenance Activities**.** Primarily, Increment 3 should include O&M activities that the MSC considers necessary but are not critical to minimum operation and maintenance of the facility. If there is remaining critical activities above the 75% included in the Minimum Level Increment, these activities should be included in Increment 3. Regional justification statement will be used for ranking purposes. For line item comparison purposes, the following specific repair and replacement work packages will transfer directly into P2 without aggregation with other work packages (<u>regardless</u> of which funding increment they are entered in) and must meet one or more of the following criteria:

(a) Funding to restore a regionally critical generating unit that is in Forced Outage status. Benefits for ranking purposes expressed in MW-Yrs (MW of nameplate capacity of generating unit multiplied by remaining life of generating unit in years).

(b) Funding to restore the de-rated capacity of a generating unit. Benefits for ranking purposes expressed in MW-Yrs (MW of de-rated capacity restored multiplied by remaining life of generating unit in years).

(c) Funding to improve the condition or reduce failure risk of a critical power component under the HydroAMP condition assessment methodology. In lieu of MW-Yrs, a numeric code must be entered to reflect the component type as follows:

1 = Generator
2 = Turbine
3 = Governor
4 = Exciter
5 = Transformer
6 = Circuit Breaker
7 = Surge Arrestor
8 = Batteries

(d) Funding to extend the life of the generating unit. Benefits for ranking purposes expressed in MW-Yrs (MW of nameplate capacity of generating unit multiplied by number of years the generating life has been extended in years).

(5) **Increments 4** – Operation and Maintenance activities that do not specifically meet the requirements above, that are deemed to be prudent and necessary, and can be completed in the budget year should be ranked in this increment. Activities that have a high expected return on investment that enable greater levels of performance in future years should be included in this capability increment.

IV-7. Performance Based Budget Increment(s). Add additional budget activities for logical, needed increments that contribute to the program goals for the PY. These additional work packages should be identified with adequate data to present a clear understanding of the benefits and improved performance that can be achieved and represented by the performance measures listed in Table IV-2. Performance measures will also be used to support increased funding for major rehab of high yield hydropower facilities and all capabilities in the PY for each study and project. The studies and projects included within the capabilities need not be scheduled for completion within the PY.

IV-8. Joint Costs Activities. Joint Costs are activities that cannot be assigned to one specific business line at Cat/Class 300 (Multipurpose with Power) projects. For non-Cat/Class 300 projects, joint activities should be assigned to the project's predominant business line. See Annex C – 2.3(b) for guidance on Joint Cost Activities.

IV-9. Budget Data Requirements. The data required from each MSC for prioritizing the budget requests for the FY 2009 Hydropower Business Line will be developed using the criteria provided in this annex and information contained in the Hydropower Business Line Criteria Matrix spreadsheet (Table IV-3). Data elements for submission are contained in the budget spreadsheet are shown in the "Criteria Matrix" tab and definitions for each data element are contained in the "Definitions" tab of the spreadsheet in Table IV-3.

TABLE IV-3

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spreadsheet.xls

TABLE IV-4

Table IV-4.xls